

# A Pulsed Nonlinear Raman Detection of Trace Organics with SERS Enhanced Sensitivity, Phase II

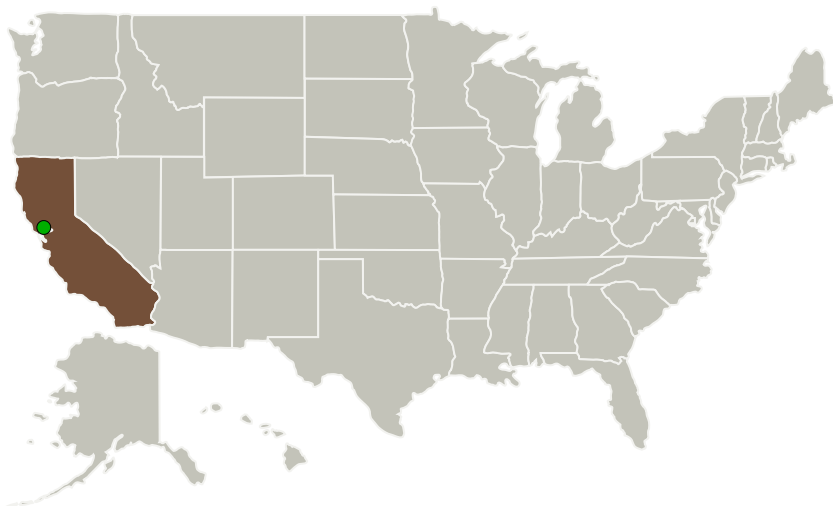
Completed Technology Project (2015 - 2017)



## Project Introduction

A significant technology gap for NASA astrobiology missions is the field detection of organics at the sub ppm level. Currently, NASA uses different sensing technologies such as Pyrolysis-GCMS to analyze planetary samples. These instruments require complex sample handling and can process only a limited number of samples. It is critical to develop an effective instrument with extended and enhanced capabilities to enable future planetary multiple-mission needs. We propose to develop a novel nonlinear Raman spectral sensing instrument for trace organic detection at the sub ppm level based on fluorescence-free surface enhanced Raman scattering (SERS). The proposed instrument will be capable of detecting the molecular signatures in Martian samples in the field with significantly improved sensitivity ( $>100,000,000$ ) and reduced noise ( $>100$ ). It will offer NASA a ultra sensitive deployable instrument suitable for robotic missions in terms of in situ measurements, resolution, bandwidth, compact size, low cost, and ruggedness. The detection of organics at the sub ppm level in Martian-like soils will be applicable to several future NASA missions, in particular future rovers for the upcoming Mars 2020 mission. These mobile, fast and agile rovers are focused on collection for sample return and require non-sampling analytical instruments.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Crystal Research, Inc.	Lead Organization	Industry	Fremont, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California

## Images



### Briefing Chart

A Pulsed Nonlinear Raman Detection of Trace Organics with SERS Enhanced Sensitivity Briefing Chart  
(<https://techport.nasa.gov/image/136468>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Crystal Research, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Suning Tang

### Co-Investigator:

Suning Tang

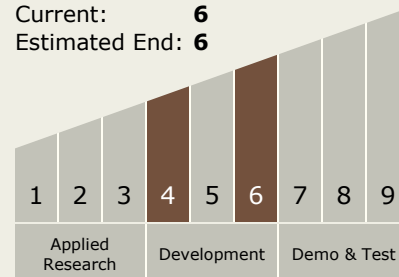
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## Technology Maturity (TRL)

Start: **4**  
Current: **6**  
Estimated End: **6**



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.5 Lasers

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System